

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 April 2004 (22.04.2004)

PCT

(10) International Publication Number
WO 2004/034329 A3

(51) International Patent Classification⁷: **G06T 7/20**

(21) International Application Number:
PCT/IB2003/004339

(22) International Filing Date: 2 October 2003 (02.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
102 47 299.8 10 October 2002 (10.10.2002) DE

(71) Applicant (for DE only): **PHILIPS INTELLECTUAL
PROPERTY & STANDARDS GMBH** [DE/DE]; Stein-
damm 94, 20099 Hamburg (DE).

(71) Applicant (for all designated States except DE, US):
KONINKLIJKE PHILIPS ELECTRONICS N.V.
[NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven
(NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ECK, Kai** [AT/DE];
c/o Philips Intellectual Property & Standards GmbH,
Weissshausstr. 2, 52066 Aachen (DE). **GIJSBERS, Geert**
[NL/DE]; c/o Philips Intellectual Property & Standards

GmbH, Weissshausstr. 2, 52066 Aachen (DE). **MOLLUS,
Sabine** [DE/DE]; c/o Philips Intellectual Property &
Standards GmbH, Weissshausstr. 2, 52066 Aachen (DE).

(74) Agent: **VOLMER, Georg**; Philips Intellectual Property &
Standards GmbH, Weissshausstr. 2, 52066 Aachen (DE).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

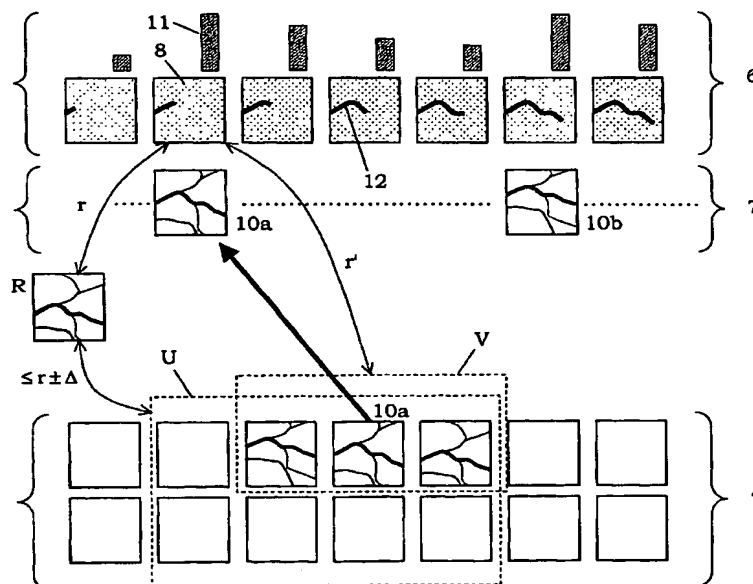
(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

[Continued on next page]

(54) Title: ASSOCIATING STORED IMAGES WITH CURRENT IMAGES



(57) Abstract: The invention relates to the association of a current (X-ray image) image of a body volume with one of several stored previous images, the ECG and the respiratory cycle being determined each time together with the images. Using this data, that one of the previous images is chosen which is closest to the current image in respect of cardiac rhythm and respiratory cycle. The resultant association yields a very high accuracy enabling superposed reproduction of the current image and the associated previous image.



(88) Date of publication of the international search report:
2 December 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

onal Application No

PCT/IB 03/04339

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06T7/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BEIER J ET AL: "Advanced subtraction angiography: mask selection and image registration" COMPUTERS IN CARDIOLOGY 1994 BETHESDA, MD, USA 25-28 SEPT. 1994, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 25 September 1994 (1994-09-25), pages 105-108, XP010147930 ISBN: 0-8186-6570-X abstract section 3 "frame selection" section 4 "image registration" -----	1-3,8-10
X	US 4 709 385 A (SEISSL JOHANN ET AL) 24 November 1987 (1987-11-24) abstract column 1, line 66 - column 2, line 44 column 3, line 5 - column 4, line 21 ----- -/-	1,3,8,9

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 June 2004

Date of mailing of the international search report

31.08.04

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Gao, M

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 03/04339

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>NADKARNI S K ET AL: "Image-based retrospective cardiac gating for three-dimensional intravascular ultrasound imaging"</p> <p>PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US,</p> <p>vol. 4687, 26 February 2002 (2002-02-26), pages 276-284, XP002272220</p> <p>ISSN: 0277-786X</p> <p>abstract</p> <p>section 2.4.2., "Lumen tracking"</p> <p>section 2.4.2., "3D IVUS reconstruction"</p> <p>figure 5</p>	1-5,8-10
A	<p>-----</p> <p>FR 2 562 743 A (AZANCOT ISAAC)</p> <p>11 October 1985 (1985-10-11)</p> <p>abstract</p> <p>pages 7-8</p> <p>-----</p>	1-5,8-10

INTERNATIONAL SEARCH REPORT

.....national application No.
PCT/IB 03/04339

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5, 8-10

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5,8-10

corresponding image determination unit using similarity
measure between current and stored images

2. claim: 6

corresponding image determination unit using
electrocardiogram transformation

3. claim: 7

corresponding image determination unit comprising a body
global motion correction unit

INTERNATIONAL SEARCH REPORT

Information on patent family members

onal Application No

PCT/IB 03/04339

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 4709385	A	24-11-1987	DE	3670745 D1	31-05-1990
			EP	0193712 A1	10-09-1986

FR 2562743	A	11-10-1985	FR	2562743 A1	11-10-1985
